IN THE CLAIMS:

Please amend the claims as indicated. A complete set of the claims is included below, as well as the current status of each claim. This listing of claims will replace all prior versions, and listings, of claims in the application.

Claims 1-18 (canceled)

Claims 19 (new) A frequency translator, comprising:

a phase accumulator;

a CORDIC phase rotator coupled to the phase accumulator comprising N stages, each stage having an inphase (I) input, a quadrature (Q) input and a phase angle (θ) input, each stage (k) further comprising a first adder to compute a quantity $I \pm 2^{-k} Q$, a second adder to compute a quantity $Q \pm 2^{-k} I$ and a third adder to compute $\theta \pm \phi_k$, where ϕ_k is an angle rotation of stage k, where each stage outputs the sum generated by each adder to be used as inputs to a succeeding stage, and wherein the N^{th} stage outputs an inphase component and a quadrature component from its first and second adders respectively that correspond to an input vector rotated by a desired phase angle;

a stochastic rounding apparatus that reduces error due to truncation of a result of higher precision arithmetic, said stochastic rounding apparatus including a third adder that adds a multi-bit random number with the truncated least significant bits of an output of said CORDIC phase rotator, wherein said stochastic rounding apparatus adds a carry bit produced by said third adder to the most significant bits of said output of said CORDIC phase rotator, and

a dithering apparatus that eliminates harmonics caused by digital to analog converter non-linearity, including a fourth adder that adds a 1-bit random number with an output of said stochastic rounding apparatus, wherein an output of said fourth adder is provided to a digital to analog converter.

Claim 20 (new) The frequency translator of claim 19, further comprising a low pass filter that filters said 1-bit random number prior to input to said fourth adder.

Claim 21 (new) A method for translating a signal in frequency, comprising:

initializing a phase accumulator with an initial phase angle;

applying an output of the phase accumulator to an N-stage CORDIC phase rotator;

calculating a quantity $I \pm 2^{-k} Q$ in each stage of the N-stage CORIDC phase rotator;

calculating a quantity $Q \pm 2^{-k} I$ in each stage of the N-stage CORDIC phase rotator;

calculating a quantity $\theta \pm \phi_k$ in each stage of the N-stage CORDIC phase rotator;

inputting to each successive stage of the N-stage CORDIC processor after the first stage an inphase (I) component, a quadrature (Q) component and phase angle θ, each of which is output by the preceding stage;

inputting to a first stage of the N-stage CORDIC processor an inphase component and a quadrature component of a complex-valued sample of the signal to be translated in frequency, and a phase angle by which to rotate the complex-valued sample of the signal;

outputting from a last stage of the N-stage CORDIC processor an inphase component and a quadrature component of the complex-valued sample of the signal to be translated in frequency rotated by approximately the angle stored in the phase accumulator;

adding a multi-bit random number with truncated least significant bits of an output of the N-stage CORDIC processor and adding a carry bit produced by said adding of said multi-bit random number to the most significant bits of said output of the N-stage CORDIC processor to produce a first output, thereby reducing error due to truncation of a result of higher precision arithmetic; and

adding a 1-bit random number with said first output and providing a second output to a digital to analog converter, thereby eliminating harmonics caused by digital to analog converter non-linearity.